



LArTPC multi-threading and acceleration workshop

March 2 – 3, 2023
Fermilab

Note: sessions will be recorded!

Related workshops coming up

- LArSoft / LArTPC multi-threading and acceleration workshop, Mar 2–3
- [AI in Production Mini-Workshop, March 7](#)
- [Workshop on Neutrino Event Generators, Mar 15–17](#)
 - “Review progress and assess requirements for common simulation software tools needed by the neutrino physics community. Discussions will include technical topics, systematic uncertainty quantification, data comparisons, standard output format.”
- Frameworks workshop
 - Currently in the planning phase.

Why a multi-threading and acceleration workshop?

1. Resource optimization and throughput bottlenecks on existing resources
 - All LArTPC neutrino experiments at the lab report significant fraction of jobs running on more than a single grid slot due to memory consumption
 - Many LArTPC computing problems are parallelizable and would benefit from various types of acceleration
2. HPC
 - Funding agencies pushing lab / experiments to use more HPC
 - Many experiments / groups have experience with this already
 - Multi-threading / optimizing for GPU also help with this transition, or are already part of it
3. Uniformity of LArTPC technology
 - LArTPCs are well-suited for direct sharing of code, techniques, technologies

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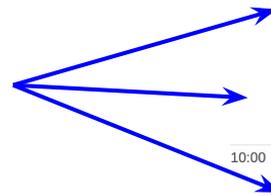
Workshop goals

- To learn the multi-threading and acceleration capabilities of frameworks and common toolkits used by LArTPC experiments;
- To share experiences across experiments about existing resource utilization and throughput problems that lend themselves to multi-threaded or acceleration solutions;
- To explore how multi-threading and acceleration is being used to address these problems and open avenues to the use HPC resources more broadly;
- To discuss the results of applying these techniques and capabilities

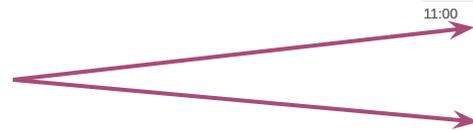
Organization of the program

FCC1W

Common tools and support



Simulation tools



Open working time: 13:30 – 17:00
(per request)

Zoom will remain open
during this time



09:00	Introductions	09:00 - 09:15
	Multi-threading support in LArSoft	<i>Kyle Knoepfel</i> 09:15 - 09:45
	Handling external libraries with conflicting thread pools	<i>Christopher Jones</i> 09:45 - 10:05
10:00	Parallelization in LArSoft reconstruction - SciDAC4 developments	<i>Giuseppe Cerati</i> 10:05 - 10:35
	Break	10:35 - 11:00
11:00	Geant4 multi-threading and tasking	<i>Soon Yung Jun</i> 11:00 - 11:35
	GEant4/CaTS/Optics: optical photon propagation on a GPU	<i>Hans-Joachim Wenzel</i> 11:35 - 12:10
12:00	Lunch break	12:10 - 13:30
13:00	Feynmann Computing Center, FCC1W: Open working time	

Organization of the program

WH8X “Hornet’s Nest”

Note 8:30 am start time!

Experiment tools and experience I

Experiment tools and experience II

08:00

Wire Cell Toolkit + art multi-threading strategies *Brett Viren*
08:30 - 09:00

09:00

Wire Cell Toolkit + art multi-threading usage *Haiwang Yu*
09:00 - 09:30

Pandora *Ryan Cross et al.*
09:30 - 10:00

10:00

ICARUS multi-threading production workflow *Tracy Usher et al.*
10:00 - 10:20

Break
10:20 - 10:50

11:00

DUNE event serialization, low level data processing and production *Thomas Junk*
10:50 - 11:20

Multi-processing for ND-LAr in larnd-sim and ndlar_flow *Matt Kramer*
11:20 - 11:50

12:00

Applications of GPUs to DL inferencing *Michael H L Wang*
11:50 - 12:20

Ground rules for the sessions

- Please be courteous and respectful at all times.
 - Workshop is subject to the [Fermilab Community Standards](#)
- This is a hybrid meeting, so:
 - Please raise hands on zoom even if in the room
 - For direct responses to the current speaker, put “DR” in the zoom chat
- Speakers in the room, please use the pointer on your computer so virtual audience can see it
- If you are remote and cannot hear something being said in the room, please say something
- Please try to keep to time.

Acknowledgements

LArSoft Project

- Katherine Lato

CSAID Administrators

- Rachel Hurd
- Carla Lloyd

Events Office

- Joy Pomello
- Melody Saperston
- Aaron Zinsmeister

The end